WHAT IS CLAIMED IS:

1. A stand-alone data aggregation server comprising:

an aggregation engine that is integrated with a multidimensional datastore and an interface;

the aggregation engine performing data aggregation operations on data loaded from a database and storing the resultant aggregated data in the multidimensional datastore; and

the interface receiving requests communicated from any one of a plurality of different computing systems, accessing the aggregation engine to retrieve from the multidimensional datastore aggregated data pertaining to said requests, and communicating the aggregated data corresponding to said requests to said one computing system that communicated said requests.

2. The stand-alone data aggregation server of claim 1, wherein the plurality of different computing systems comprise an OLAP server.

3. The stand-alone data aggregation server of claim 2, wherein the plurality of different computing systems comprise a plurality of different OLAP servers distributed by different vendors.

4. The stand-alone data aggregation server of claim 2, wherein the plurality of different computing systems comprise at least one database system.

5. The stand-alone data aggregation server of claim 4, wherein the at least one database system comprises one of : a data warehouse system, a data mart system, an RDBMS system, an OLAP system, a ROLAP system, a MOLAP system, and a URL directory management system.

6. The stand-alone data aggregation server of claim 1, wherein the interface implements a standard protocol for accessing data.

7. The stand-alone data aggregation server of claim 1, wherein the standard protocol comprises one of OLDB, OLE-DB, ODBC, SQL, and JDBC.

8. The stand-alone data aggregration server of claim 1, wherein computational tasks performed by the aggregation engine is restricted to data aggregation operations.

9. The stand-alone data aggregation server of claim 1, wherein said interface extracts dimensions from the received requests and forwards the dimensions to a storage management module, and wherein the storage management module accesses locations of the multidimensional datastore based upon the forwarded dimensions and returns the retrieved

data back to the interface for communication to the one coomputing system that generated the requests.

10. The stand-alone data aggregation server of claim 1, further comprising control logic that, upon determining that multidimensional datastore does not contain aggregated data required to service at least one given request, controls the aggregation engine to perform aggregation operations to thereby generate the required aggregated data and return the required aggregated data back to interface for communication to one coomputing system that generated the at least one given request.

11. The stand-alone data aggregation server of claim 10, wherein the control logic controls a storage management module to store the required aggregation data generated by the aggregation engine in the multidimensional database.

12. The stand-alone data aggregation server of claim 1, wherein data stored in the multidimensional datastore is logically partitioned into N dimensions, wherein the aggregation engine performs a first stage of aggregation operations along a first dimension, and performs and second stage of aggregation operations for a given slice in the first dimension along N-1 dimensions other than the first dimension.

13. The stand-alone data aggregation server of claim 12, wherein the aggregation engine stores the resultant data of aggregration operations for the given slice as a record in a data file, wherein location of the record in the data file is stored in a directory.

14. The stand-alone data aggregation server of claim 13, wherein the directory stores, for a given record, a start address and end address of the record and a physical address of the data file.

15. The stand-alone data aggregation server of claim 1, wherein time delay in responding to said requests is equivalent to accessing a local datastore of the one computer system.

16. A relational database management system (RDBMS) comprising:

a relational datastore storing fact data;

an aggregation module, operatively coupled to the relational datastore, for aggregating the fact data and storing the resultant aggregated data in a non-relational multi-dimensional datastore;

a reference generating mechanism for generating a first reference to aggregated fact data generated by the aggregation module; and

a query processing mechanism for processing a given query statement, wherein, upon identifying that the given query statement is on said first reference, communicates with said aggregation module to retrieve portions of aggregated fact data pointed to by said first reference that are relevant to said given query statement.

17. The RDBMS of claim 16, wherein said reference generating mechanism generates a second reference to fact data stored in the relational datastore.

18. The RDBMS of claim 16, wherein said aggregation module includes a query handling mechanism for receiving query statements, and wherein communication between said query processing mechanism and said query handling mechanism is accomplished by forwarding the given query statement to the query handling mechanism of the aggregation module.

19. The RDBMS of claim 18, wherein said query handling mechanism extracts dimensions from the received query statement and forwards the dimensions to a storage handler, wherein the storage handler accesses locations of the non-relational multi-dimensional datastore based upon the forwarded dimensions and returns the retrieved data for communication to the user.

20. The RDBMS of claim 16, wherein said aggregation module includes a data loading mechanism for loading at least fact data from the relational datastore, an aggregation engine for aggregating the fact data, and a storage handler for storing the fact data and resultant aggregated fact data in the non-relational multi-dimensional datastore.

21. The RDBMS of claim 20, wherein said aggregation module includes control logic that, upon determining that the non-relational multi-dimensional datastore does not contain data required to service the given query statement, controls the aggregation engine to aggregate at least fact data required to service the given query statement and controls the aggregation module to return the aggregated data for communication to the user.

22. The RDBMS of claim 16, further comprising OLAP analysis logic integral to the RDBMS.

23. The RDBMS of claim 16, for use as an enterprise wide data warehouse that interfaces to a plurality of information technology systems.

24. The RDBMS of claim 16, for use as a database store in an informational database system.

25. The RDBMS of claim 24, wherein the informational database system requires aggregation and calculations on basic detailed data.

26. The RDBMS of claim 16, for use as a database store in an operational database system.

27. The RDBMS of claim 26, wherein the operational database system is part of one of the following systems: a Customer Relations Management System, an Enterprise Resource Planning System, a Customer Data Record Database System.

28. The RDBMS of claim 16, wherein user operations in querying the relational datastore and non-relational multi-dimensional datastore generate natural language queries communicated from a client machine.

29. The RDBMS of claim 28, wherein said client machine comprises a web-enabled browser to generate said natural language queries.

30. The RDBMS of claim 25, wherein said query processing mechanism of the RDBMS communicates with said aggregation module over a standard interface.

31. The RDBMS of claim 30, wherein the standard interface comprises one of: OLDB, OLE-DB, ODBC, SQL, and JDBC.

32. A relational database management system (RDBMS) comprising:

a relational datastore storing fact data; and

an integrated aggregation module, operatively coupled to the relational datastore, for aggregating the fact data and storing the resultant aggregated data in a non-relational multi-dimensional datastore.

33. The RDBMS of claim 32, wherein user operations in querying of the non-relational multi-dimensional datastore is no different than querying data in the relational store.

34. The RDBMS of claim 32, wherein said aggregation module includes a data loading mechanism for loading at least fact data from the relational datastore, an aggregation

engine for aggregating the fact data and a storage handler for storing the fact data and resultant aggregated fact data in the non-relational multi-dimensional datastore.

35. The RDBMS of claim 34, wherein said aggregation module includes control logic that, upon determining that the non-relational multi-dimensional datastore does not contain data required to service a given query statement, controls the aggregation engine to aggregate at least fact data required to service the given query statement and controls the aggregation module to return the aggregated data for communication to the user.

36. The RDBMS of claim 32, further comprising OLAP analysis logic integral to the RDBMS.

37. The RDBMS of claim 32, for use as an enterprise wide data warehouse that interfaces to a plurality of information technology systems.

38. The RDBMS of claim 32, for use as a database store in an informational database system.

39. The RDBMS of claim 38, wherein the informational database system requires aggregation and calculations on basic detailed data.

40. The RDBMS of claim 32, for use as a database store in an operational database system.

41. The RDBMS of claim 40, wherein the operational database system is part of one of the following systems: a Customer Relations Management System, an Enterprise Resource Planning System, a Customer Data Record Database System.

42. The RDBMS of claim 42, wherein user operations in querying the relational datastore and non-relational multi-dimensional datastore generate natural language queries communicated from a client machine.

43. The RDBMS of claim 42, wherein said client machine comprises a web-enabled browser to generate said natural language queries.

44. The RDBMS of claim 42, further comprising a query processing mechanism for servicing user-generated queries, wherein said query processing mechanism communicates with said aggregation module over a standard interface.

45. The RDBMS of claim 44, wherein the standard interface comprises one of: OLDB, OLE-DB, ODBC, SQL, and JDBC.

46. In a relational database management system (RDBMS) comprising a relational datastore storing fact data, a method for aggregating the fact data and providing query access to the aggregated data comprising the steps of:

(a) providing an integrated aggregation module, operatively coupled to the relational datastore, for aggregating the fact data and storing the resultant aggregated data in a non-relational multi-dimensional datastore;

(b) in response to user input, generating a reference to aggregated fact data generated by the aggregation module; and

(c) processing a given query statement generated in response to user input, wherein, upon identifying that the given query statement is on said reference, retrieving from the integrated aggregation module portions of aggregated fact data pointed to by said reference that are relevant to said given query statement.

47. The method of claim 46, wherein step (c) further comprises the step of extracting dimensions from the given query statement, accessing locations of the non-relational multi-dimensional datastore based upon the extracted dimensions, and returning the retrieved data back to the user.

48. The method of claim 46, wherein step (a) further comprises the step of loading at least fact data from the relational datastore, aggregating the fact data, and storing the fact data and resultant aggregated fact data in the non-relational multi-dimensional datastore.

49. The method of claim 48, wherein said aggregation module, upon determining that the non-relational multi-dimensional datastore does not contain data required to service the given query statement, controls the aggregation engine to aggregate at least fact data required to service the given query statement and returns the aggregated data back to the user.

50. The method of claim 46, further comprising the step of performing OLAP data analysis operations on the retrieved data.

51. The method of claim 46, wherein said RDBMS is used as an enterprise wide data warehouse that interfaces to a plurality of information technology systems.

52. The method of claim 46, wherein said RDBMS is uses as a database store in an informational database system.

53. The method of claim 52, wherein the informational database system requires aggregation and calculations on basic detailed data.

54. The method of claim 46, wherein said RDBMS is used as a database store in an operational database system.

55. The method of claim 54, wherein the operational database system is part of one of the following systems: a Customer Relations Management System, an Enterprise Resource Planning System, a Customer Data Record Database System.

56. The method of claim 46, wherein user operations in querying the relational datastore and non-relational multi-dimensional datastore generate natural language queries communicated from a client machine.

57. The method of claim 56, wherein said client machine comprises a web-enabled browser to generate said natural language queries.

58. The method of claim 46, wherein said RDBMS comprises a query servicing mechanism that processes query statements and communicates with said aggregation module in the event that a given query statement refers to data stored in the non-relational multi-dimensional datastore.

59. The method of claim 58, wherein said query serving mechanism communicates with said aggregation module over a standard interface.

60. The method of claim 59, wherein the standard interface comprises one of: OLDB, OLE-DB, ODBC, SQL, and JDBC.

61. A database management system (DBMS) comprising:

a relational datastore storing data in tables;

an aggregation module, operatively coupled to the relational datastore, for aggregating the data stored in the tables of the relational datastore and storing the resultant aggregated data in a non-relational datastore;

a reference generating mechanism for generating a first reference to data stored in the relational datastore and a second reference to aggregated data generated by the aggregation module and stored in the non-relational datastore; and

a query processing mechanism for processing query statements; wherein, upon identifying that a given query statement is on said second reference, the query processing mechanism communicates with said aggregation module to retrieve portions of aggregated data identified by said reference that are relevant to said given query statement.

62. The DBMS of claim 61, for use as a relational database management system (RDBMS) wherein the relational datastore stores fact data.

63. The DBMS of claim 62, wherein the reference generating mechanism comprises a view mechanism.

64. The DBMS of claim 61, wherein the reference generating mechanism comprises a native trigger mechanism.

65. The DBMS of claim 61, wherein the non-relational datastore comprises a multi-dimensional database.

66. The DBMS of claim 61, wherein the reference generating mechanism is part of a query servicing mechanism for servicing user submitted query statements.

67. The DBMS of claim 66, wherein said aggregation module includes a query handling mechanism for receiving query statements, and wherein communication between said query processing mechanism and said query handling mechanism is accomplished by forwarding the given query statement to the query handling mechanism of the aggregation module.

68. The DBMS of claim 67, wherein said query handling mechanism extracts at least one dimension from the received query statement and forwards the at least one dimension to the storage handler, and wherein the storage handler accesses locations of the non-relational datastore based upon the forwarded at least one dimension and returns the retrieved data back to the query servicing mechanism for communication to the user.

69. The DBMS of claim 68, wherein said aggregation module includes a data loading mechanism for loading data from the relational datastore, an aggregation engine for aggregating the data loaded from the relational datastore, and a storage handler for storing in the non-relational datastore the data loaded from the relational datastore and the aggregated data generated by the aggregation engine.

70. The DBMS of claim 69, wherein said aggregation module includes control logic that, upon determining that the non-relational datastore does not contain data required to service a given query statement, controls the aggregation engine to generate aggregated

data required to service the given query statement and controls the aggregation module to return the aggregated data back to the query servicing mechanism for communication to the user.

71. The DBMS of claim 61, further comprising OLAP analysis logic integral to the DBMS.

72. The DBMS of claim 61, further comprising OLAP presentation logic integral to the DBMS.

73. The DBMS of claim 61, for use as an enterprise wide data warehouse that interfaces to a plurality of information technology systems.

74. The DBMS of claim 61, for use as a database store in an informational database system.

75. The DBMS of claim 74, wherein the informational database system requires aggregation and calculations on basic detailed data.

76. The DBMS of claim 71, for use as a database store in an operational database system.

77. The DBMS of claim 76, wherein the operational database system is part of one of the following systems: a Customer Relations Management System, an Enterprise Resource Planning System, a Customer Data Record Database System.

78. The DBMS of claim 61, wherein said query statements are generated by a query interface in response to communication of a natural language query communicated from a client machine.

79. The DBMS of claim 78, wherein said client machine comprises a web-enabled browser to communicate said natural language query to the query interface.

80. The DBMS of claim 67, wherein the query processing mechanism of the DBMS and the query handling mechanism of the aggregation module communicate over a standard interface.

81. The DBMS of claim 80, wherein the standard interface comprises one of: OLDB, OLE-DB, ODBC, SQL, and JDBC.

82. The DBMS of claim 61, for use as an object database management system (ODBMS).

83. The DBMS of claim 61, for use as an object-relational database management system (ORDBMS).

84. A database management system (DBMS) comprising:

a relational datastore storing data in tables; and

an integrated aggregation module, operatively coupled to the relational datastore, for aggregating the data stored in the tables of the relational datastore and storing the resultant aggregated data in a non-relational datastore.

85. The DBMS of claim 84, further comprising a relational part that includes the relational datastore and support mechanisms.

86. The DBMS of claim 85, wherein bi-directional data flow occurs between the relational part and the integrated aggregation module whereby data stored in the relational datastore in loaded into the aggregation module and aggregated data stored in the non-relational datastore of the aggregation module is communicated to the relational part.

87. The DBMS of claim 84, for use as a relational database management system (RDBMS) wherein the relational datastore stores fact data.

88. The DBMS of claim 84, wherein the non-relational datastore comprises a multi-dimensional database.

89. The DBMS of claim 84, wherein user operations in querying the non-relational datastore is no different than querying the relational datastore.

90. The DBMS of claim 84, wherein said aggregation module includes a data loading mechanism for loading data from the relational datastore, an aggregation engine for aggregating the data loaded from the relational datastore, and a storage handler for storing in the non-relational datastore the data loaded from the relational datastore and the aggregated data generated by the aggregation engine.

91. The DBMS of claim 90, wherein said aggregation module includes control logic that, upon determining that the non-relational datastore does not contain data required to service a given query, controls the aggregation engine to generate aggregated data required

to service the given query and controls the aggregation module to return the aggregated data for communication to the requestor.

92. The DBMS of claim 84, further comprising OLAP analysis logic integral to the DBMS.

93. The DBMS of claim 92, further comprising OLAP presentation logic integral to the DBMS.

94. The DBMS of claim 84, for use as an enterprise wide data warehouse that interfaces to a plurality of information technology systems.

95. The DBMS of claim 84, for use as a database store in an informational database system.

96. The DBMS of claim 95, wherein the informational database system requires aggregation and calculations on basic detailed data.

97. The DBMS of claim 84, for use as a database store in an operational database system.

98. The DBMS of claim 97, wherein the operational database system is part of one of the following systems: a Customer Relations Management System, an Enterprise Resource Planning System, a Customer Data Record Database System.

99. The DBMS of claim 29, wherein the user operations in querying the relational datastore and non-relational datastore generate natural language queries communicated from a client machine.

100. The DBMS of claim 99, wherein said client machine comprises a web-enabled browser to generate said natural language queries.

101. The DBMS of claim 86, wherein the relational part of the DBMS and the aggregation module communicate over a standard interface.

102. The DBMS of claim 101, wherein the standard interface comprises one of: OLDB, OLE-DB, ODBC, SQL, and JDBC.

103. The DBMS of claim 84, for use as an object database management system (ODBMS).

104. The DBMS of claim 84, for use as an object-relational database management system (ORDBMS).

105. In a database management system (DBMS) comprising a relational datastore storing data in tables, a method for aggregating the data stored in the tables of the relational datastore and providing query access to the aggregated data, the method comprising the steps of:

(a) providing an integrated aggregation module, operatively coupled to the relational datastore, for aggregating the data stored in the relational datastore and storing the resultant aggregated data in a non-relational datastore;

(b) in response to user input, generating a reference to aggregated data generated by the aggregation module; and

(c) processing a given query statement generated in response to user input, wherein, upon identifying that the given query statement is on said reference, retrieving from the integrated aggregation module portions of aggregated data identified by said reference that are relevant to said given query statement.

106. The method of claim 105, wherein step (c) further comprises the step of extracting at least one dimension from the given query statement, accessing locations of the non-relational datastore based upon the extracted at least one dimension, and returning the retrieved data back to the user.

107. The method of claim 105, wherein step (a) further comprises the steps of loading data from the relational datastore, aggregating the data loaded from the relational datastore, and storing in the non-relational datastore the data loaded from the relational datastore and resultant aggregated data.

108. The method of claim 107, wherein said aggregation module, upon determining that the non-relational datastore does not contain data required to service the given query statement, controls the aggregation engine to generate aggregated data required to service the given query statement and returns the aggregated data back to the user.

109. The method of claim 105, wherein the DBMS comprises a relational database management system (RDBMS) storing fact data in the relational datastore.

110. The method of claim 105, wherein the non-relational datastore comprises a multi-dimensional database.

111. The method of claim 105, wherein the DBMS includes OLAP analysis logic integral to the DBMS.

112. The method of claim 111, wherein the DBMS includes OLAP presentation logic integral to the DBMS.

113. The method of claim 105, wherein the DBMS is used as an enterprise wide data warehouse that interfaces to a plurality of information technology systems.

114. The method of claim 105, wherein the DBMS is used as a database store in an informational database system.

115. The method of claim 114, wherein the informational database system requires aggregation and calculations on basic detailed data.

116. The method claim 105, wherein the DBMS is used as a database store in an operational database system.

117. The method of claim 116, wherein the operational database system is part of one of following systems: a Customer Relations Management System, an Enterprise Resource Planning System, a Customer Data Record Database System.

118. The method of claim 105, wherein user operations in querying the relational datastore and non-relational datastore generate natural language queries communicated from a client machine.

119. The method of claim 118, wherein said client machine comprises a web-enabled browser to generate said natural language queries.

120. The method of claim 105, wherein communication with the aggregation module occurs over a standard interface.

121. The method of claim 120, wherein the standard interface comprises one of: OLDB, OLE-DB, ODBC, SQL, and JDBC.

122. The method of claim 105, wherein the DBMS comprises an object database management system (ODBMS).

123. The method of claim 105, wherein the DBMS comprises as an object-relational database management system (ORDBMS).

124. An on-line analytical processing (OLAP) system comprising:

a plurality of client machines communicating with an OLAP server over a network;

the OLAP server including OLAP analysis logic and presentation logic to enable user-directed OLAP analysis on data; and

the stand-alone aggregation server of claim 1 that operably communicates with the OLAP server to perform data aggregation operations on the data, and store and manage such data for access by the OLAP server.

125. The OLAP system of claim 124, wherein the network includes the infrastructure of the Internet.

126. The OLAP system of claim 125, wherein said client machines include a web-browser-based user interface that enables said user-directed OLAP analysis.

127. An on-line analytical processing (OLAP) system comprising:

a plurality of client machines communicating with an OLAP server over a network;

the OLAP server including OLAP analysis logic and presentation logic to enable user-directed OLAP analysis on data; and

the DBMS of any one of claims 16,32,61,84 that operably communicates with the OLAP server to perform data aggregation operations on the data, and store and manage such data for access by the OLAP server.

128. The OLAP system of claim 127, wherein the OLAP server is integral to the DBMS.

129. The OLAP system of claim 127, wherein the network includes the infrastructure of the Internet.

130. The OLAP system of claim 129, wherein said client machines include a web-browser-based user interface that enables said user-directed OLAP analysis.

131. A data warehouse system comprising:

a plurality of client machines communicating with a DBMS over a network;

the DBMS being of any one of the DBMS of claims 16,32,61,84 that operably communicates with the client machines to perform data aggregation operations on data, and store and manage such data for access by the client machines.

132. The data warehouse of claim 131, wherein the network includes the infrastructure of the Internet.

133. The data warehouse of claim 131, wherein said client machines include a web-browser-based user interface that enables user access to the DBMS.

134. A method of aggregating data comprising the steps of:

(a) loading data from a data source into a mutidimensional datastore, wherein the data is logically partitioned into N dimensions;

(b) performing a first stage of data aggregation operations along a first dimension in the multi-dimensional datastore; and

(c) performing a second stage of aggregation operations for a given slice in the first dimension along N-1 dimensions other than the first dimension in the multi-dimensional datastore.

135. In a database system comprising data having at least one dimension logically organized into multiple hierarchies of items, a method for transforming the multiple hierarchies of items into a single hierarchy that is functionally equivalent to the multiple hierarchies, the method comprising the step of:

linking a given child item with a parent item in the single hierarchy when no other child item linked to the parent item has a child item in common with the given child item.

136. The method of claim 135, wherein, in the event that at least one other child item linked to the parent item has a child item in common with the given child item, the given child item is not linked with the parent item in the single hierarchy.

137. A data aggregation engine comprising:

a hierarchy transformation module that identifies at least one dimension of data logically organized into multiple hierarchies of items, and transforms the multiple hierarchies of items into a single hierarchy (that is functionally equivalent to the multiple hierarchies) by

linking a given child item with a parent item in the single hierarchy when no other child item linked to the parent item has a child item in common with the given child item;

an aggregation module that aggregates the data based upon the single hierarchy.

138. The data aggregation engine of claim 137, wherein, in the event that at least one other child item linked to the parent item has a child item in common with the given child item, the hierarchy transformation module does not link the given child item with the parent item in the single hierarchy.

139. The data aggregation engine of claim 137, integrated with an OLAP server (comprising OLAP analysis logic and presentation logic) and client machines operably coupled to the OLAP server to provide user-directed OLAP analysis, to thereby realize an OLAP system capable of performing data aggregation operations on the data, and storing and managing such data.

140. The OLAP system of claim 139, wherein the network includes the infrastructure of the Internet.

141. The OLAP system of claim 140, wherein said client machines include a web-browser-based user interface that enables user access to the OLAP server.

142. The data aggregation engine of claim 137, integral to a DBMS to thereby realize an improved DBMS capable of performing data aggregation operations on the data, and storing and managing such data.

143. The data aggregation engine of claim 137, integral to a DBMS operably coupled to a plurality of client machines over a network , to thereby realize a data warehouse capable of performing data aggregation operations on the data, and storing and managing such data.

144. The data warehouse of claim 143, wherein the network includes the infrastructure of the Internet.

145. The data warehouse of claim 144, wherein said client machines include a web-browser-based user interface that enables user access to the DBMS.

146. The data aggregation engine of claim 137, integrated with an server (comprising analysis logic) and client machines operably coupled to the server to provide user-directed analysis, to thereby realize a decision support system capable of performing data aggregation operations on the data, and storing and managing such data.

147. The decision support system of claim 146, wherein the network includes the infrastructure of the Internet.

148. The decision support system of claim 147, wherein said client machines include a web-browser-based user interface that enables user access to the server.

149. A decision support system operable with an enterprise, the system comprising:

a plurality of client machines communicating with a server over a network;

the server including analysis logic to enable user-directed analysis on data; and

the stand-alone aggregation server of claim 1 that operably communicates with the server to perform data aggregation operations on the data, and store and manage such data for access by the server.

150. The decision support system of claim 149, wherein the network includes the infrastructure of the Internet.

151. The decision support system of claim 150, wherein said client machines include a web-browser-based user interface that enables said user-directed analysis.